Dr. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY, AURANGABAD

CIRCULAR NO.SU/Sci. & Tech./Colleges./NEP/24/2023

It is hereby inform to all concerned that, the syllabi prepared by the Board of Studies & Ad-hoc Boards and recommended by the Dean, Faculty of Science & Technology, the Hon'ble Vice-Chancellor has accepted **the following curriculum of Post Graduate Degree Courses as per Norms of National Education Policy – 2020 under the Faculty of Science & Technology run to the Affiliated Colleges, Dr.Babasaheb Ambedkar Marathwada University** in his emergency powers under section 12(7) of the Maharashtra Public Universities Act, 2016 on behalf of the Academic Council as appended herewith.

Sr.No.	Syllabi of Affiliated Colleges under BAMU, Aurangabad.	Semester
1.	M.Sc.Chemistry Specialization: Analytical Chemistry, Inorganic Chemistry, Physical Chemistry, Organic Chemistry, Polymer Chemistry and Drug Chemistry.	Ist and IInd Semester
2.	M.Sc.Electronics	Ist Semester
3.	M.Sc.Herbal Technology	Ist to IVth Semester
4.	M.Sc.Industrial Chemistry	Ist and IInd Semester
5.	MCA(Science)	Ist and IInd Semester

This is effective from the Academic Year 2023-24 and onwards.

All concerned are requested to note the contents of this circular and bring the notice to the students, teachers and staff for their information and necessary action.

University Campus,
Aurangabad-431 004.
REF.NO.SU/NEP/2023/10551-59
Date:- 22.08.2023.

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Deputy Registrar,
Academic Section

Copy forwarded with compliments to :-

1] **The Principal of all concerned affiliated Colleges, Dr. Babasaheb Ambedkar Marathwada University,.**
2] **The Director, University Network & Information Centre, UNIC, with a request to upload this Circular on University Website.**

Copy to :-

1] The Director, Board of Examinations & Evaluation, Dr.BAMU,A'bad.
2] The Section Officer,[M.Sc.Unit] Examination Branch,Dr.BAMU,A'bad.
3] The Programmer [Computer Unit-1] Examinations, Dr.BAMU,A'bad.
4] The Programmer [Computer Unit-2] Examinations, Dr.BAMU,A'bad.
5] The In-charge,[E-Suvidha Kendra], Rajarshi Shahu Maharaj Pariksha Bhavan, Dr.BAMU,A'bad.
6] The Public Relation Officer, Dr.BAMU,A'bad.
7] The Record Keeper, Dr.BAMU,A'bad.

DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY, AURANGABAD

FACULTY OF SCIENCE & TECHNOLOGY

Post-Graduate 2Years/1Year P.G. Programme in Science (MCA)

As per National Education Policy-2020

(To be implemented from Academic Year -2023-24)

Course Structure and Curriculum(Draft)

(Outcome Based Credit System)

Subject: - MCA (Science)

Course Structure

Course : MCA (Science)
Duration : 2 Years – (Four Semesters)

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad
Masterof Computer Applications(Science)
(Choice Based Credit & Grade System)

OBJECTIVE OF MCA COURSE M.C.A program prepares students to take up positions as systems analysts, system designers, Programmers and managers in any field related to information technology. The program, therefore, aims at imparting comprehensive knowledge with equal emphasis on theory and practice. The M.C.A. students are encouraged to spend a full semester working in the industry. The institute is giving them insight into the workings of the IT world.

Rules and Regulations

1. Eligibility and Selection Criteria

a) "A candidate seeking admission to Master of Computer Application (MCA) should have passed Bachelor's Degree examination of any faculty with atleast50% of marks, of Dr. Babasaheb Ambedkar Marathwada University or any other degree equivalent thereto and have Mathematics/Statistics as one of the subjects at Degree level or HSC level. However, in case of students belonging to BackwardClasses, a relaxation of 5% shall be given for admission."

OR

Appeared at the final year examination of a post 10+2 course of minimum three years duration leading to an award of Bachelor's Degree, in any discipline by the Association of Indian Universities or has passed with minimum 50% of marks in the aggregate (45% in case of candidate who is domiciled inMaharashtraandbelongstothereservedcategories)orappearedatanexaminationconsideredequivalentthereto wouldbetreatedaseligible.Also,thecandidatemusthavepassedmathematics/BusinessMathematics&Statisticspaperfor10+2 or graduation Level. AND

Passed the CET conducted by Director of Technical Education Maharashtra State with nonzero score for that year.

b) The Institute reserves the right to cancel the admissions of any student and ask him to discontinue his studies at any stage of his/her carrier on the grounds of unsatisfactory academic performance, indiscipline or any misconduct.

2. Duration

Duration of the MCA program shall be a minimum of 2 years/4 semesters and maximum of 4 years from date of admission. The entire period of the fourth semester shall be devoted for the Major Project work and seminar.

3. Admission / PromotionCriteria

If candidate gets selected for MCA course through DTE admission process, he/she have to apply on the application form of the Institute provided with the prospectus. Once the candidate is admitted to the MCA course, he/she will be promoted to next semester with full carryon; subject to the registration of candidate in every consecutive semester. Dropout candidate will be allowed to register for respective semester in which he/she has failed, subject to the condition that his/her tenure should not exceed more than twice the duration of MCA course from the date of first registration at respective institute. The admission of concern candidate will automatically get cancelled if he/she fails to complete the course in maximum period (four years).

4. Credits and Degrees

i. A candidate who has successfully completed all the Foundation, Core, Elective courses and Project Work as prescribed for the MCA Course and Service courses as approved by the University with prescribed CGPA shall be eligible to receive the degree.

ii. One Credit shall mean one teaching period of one hour per week for one semester (of15weeks) for theory courses and two hours/week of practical for one semester.

Attendance: A student must have 75% of mandatory attendance in each Course for appearing in the examination. In the event of Non-Compliance of Attendance criteria (75%), students will have to seek admission next year so as to complete the course. However, Student having 65% attendances with medical certificate can apply to the institute for consideration of attendance.

Grade Awards

i. In order to pass the examination following choice-based credit and grading system (CBC&GS)will be followed. Ten-point rating scale shall be used for evaluation of performance of the student to provide Letter Grade for each course and overall grade for this course. Grade points are based on the total number of marks obtained by him/her in all the heads of the examination of the course. These grade points and their equivalent range of the marks are shown separately in following:

Table –I:Ten Point grades and grade description

Sr. No.	Equivalent Percentage	Grade points for SGPA and CGPA	Grade	Grade Description
1	90 –100	9.00 –10	O	Outstanding
2	80 –89.99	8.00 –8.99	A++	Excellent
3	70 –79.99	7.00 –7.99	A+	Exceptional
4	60 –69.99	6.00 –6.99	A	Very Good
5	55 –59.99	5.50 –5.99	B+	Good
6	50 –54.99	5.00 –5.49	B	Fair
7	45 –49.99	4.50 –4.99	C+	Average
8	40.01 – 44.99	4.01 –4.49	C	Below Average
9	40	4.00	D	Pass
10	Below 40	0.00	F	Fail

In the event of student registered for the examination (i.e. Internal Tests / End Semester Examination / Practical / Seminar / Project Viva-voce), non-appearance shall be treated as the student deemed to be absent in the respective course.

Minimum D grade shall be the limit to clear /pass the course/subject. A student with F grade will be considered as 'fail' in the concerned course and he/she has to clear the course by reappearing in the next successive semester examinations. There will be no revaluation or recounting scheme under this system.

Semester Grade Point Average (SGPA) and then Cumulative Grade Point Average (CGPA) shall be computed. Results will be announced at the end of each semester and Cumulative Grade Card with CGPA will be given on completion of the course.

The computation of SGPA and CGPA will be as below:

i. Semester Grade Point Average (**SGPA**) is the weighted average of points obtained by a student in a semester and will be computed as follows:

$$SGPA=\frac{Sum(CourseCredit*No.ofPointsincoursegainedbystudent)}{Sum(CourseCredit)}$$

The SGPA for all the four semesters will be mentioned at the end of every semester.

ii. The Cumulative Grade Point Average (**CGPA**) will be used to describe the overallperformanceofastudentinallsemestersofthecourseandwillbecomputedasfollows:

$$CGPA=\frac{Sum(AllFourSemesterSGPA)}{TotalNumberofSemesters}$$

The SGPA and CGPA shall be rounded off to the second place of decimal

Evaluation Scheme

Each theory course will be of 100 Marks and be divided in to Internal Examination (Sessional) of 20MarksandSemester End Examination of80 Marks.(20+80=100)

Each Practical Course will be of 50 Marks (Internal + External) = (10+ 40=50).

Industry Project/ Internship in Sem-IV will be 350 Marks (Internal + External) =

(70+280=350).Seminar in Sem-IV will be for 50 Marks.

For Theory Course Internal

Evaluation Scheme

There shall be weekly assessment in the form of test/ Assignment/ Tutorials/ Seminars/ Presentations/ laboratory work/ Fieldwork/ Project Work throughout the semester. Aggregation of these marks will be considered for the internal evaluation of 20marks.

Semester End Examination EvaluationScheme

- English shall be the medium of instruction and examination.
- Examination shall be conducted at the end of each semester as per the academic calendar notified by university.
- The Semester End Examination theory question paper will have two parts**(20+60=80)**Marks
- **PART A** will carry short question (fill in the blanks/multiple choice questions/match the columns/ state true or false/answer in one sentence) as compulsory questions and it should cover entire syllabus (20Marks).
- **PART B** will carry7questions out of which there shall be atleast one question from eachunit, student will have to answer any 5 questions out of 7.

For Practical Course

i. **Internal Evaluation Scheme**

A student should complete lab assignments and practical's given by course teacher. However, in addition to that teacher can allot a mini project to students for better evaluation but, assignments are compulsory. Internal evaluation for the practical will be considered for10 Marks.

ii. **ExternalEvaluationScheme**

Under this roof, a student has to face practical examinations in which he / she has to complete the task on computer system (It may be computer program or testing) given by External Examiner. Also student has to present seminar or viva-voce in front of External Examiner. External evaluation for the practical will be considered for 40 Marks.

ForIndustryProject/ Internship –

All students will have to undergo for Industry Project/ Internship with an industrial, business, service organization or institute. The condition of successfully completing the program shall not be deemed to have been satisfied unless a student undergoes Industry Project/ Internship under the supervision of the institute in organization as approved by the institute from time to time. Each student will be required to submit the Industry Project/ Internship report to the institute for the work undertaken during this period.

Internal Evaluation–

Internal Evaluation for the In-plant Training Project will be of 50 marks that will be evaluated by the respective faculty / guide depending upon presentation /review /performance during project/ report writing/ fieldwork/seminars etc.

External Evaluation Scheme

Student has to present seminar/ viva-voce/ demonstration of project in front of External Examiner. External evaluation for the project will be considered for 80%Marks.

The project will be assessed by the external examiner and the guide separately on the basis of the following criteria tentatively.

- Innovativeldea15%
- Content 15%
- Preparation of Project Report30%
- Presentation/Viva-voce40%
- If student failed to complete the project within scheduled time, then he/she has to reappear and register freshly with new project topic after paying required fees for that semester.

General Clause

It may be noted that beside the above specified rules and regulations all the other rules and regulations in force and applicable to semester system in post-Graduate courses in Dr. Babasaheb Ambedkar Marathwada University will be applicableasamendedfromtimetotimebytheUniversity.Thestudentsshall abide by all such Rules and Regulations.

AS PER National Education Policy (NEP) 2020

1. **Structure.**

Two Year Post-Graduate Program MCA (Science)Faculty of Science & Technology

Year /level	Sem.	Major subject		RM	OJT /FP	RP	Credits	Degree
		DSC Core Mandatory	DSE (Elective)					
First year 6.0	I	3(4) +2=14	4	4			22	PG Diploma (after 3 years degree)
	II	3(4) +2=14	4		4 Complete during summer break		22	
Cum. Cr. ForPG Diploma		28	08	4	4		44	
Exit option with Post-graduate Diploma (44 credits) after first year or two semester with completion ofcourses equivalent to 44 credits								
Second Year 6.5	III	3(4)+2=14	4			4	22	**PG Degree after 3 years UG or PG Degree after 4 years UG**
	IV	3(4)=12	4			6	22	
Cum. Cr. For1 year PG Degree		26	8			10	44	
Cum. Cr. For2 years PG Degree		54	16	4	4	10	88	
2 Years -4 sem.PG Degree (88 credits) after three year UG Degree or 1 Year-2 sem. PG Degree (44 credits) after four year UG degree								

ABBREVIATION:

Major: A course, which should compulsorily be studied by the student as requirement of core or majorsubject is termed as a core course.

DSE: Generally, a course which can be chosen from a pool of course and which may be very specific or specialized or advanced or supportive to the discipline/subject of study or which provides an extended scope or which enables an exposure to some other discipline/subject/domain or nurtures the candidates proficiency/skill is called as elective course.

OJT: On-the- Job Training

FP: Field Project/Internship/Apprenticeship (Corresponding to the Major (Core) Subject

RP:-Research Project Corresponding to the Major (Core) Subject

Note- Master Programme is based on DSC Specialization

Course and Credit distribution structure for Two year Programme with Multiple Entry and Exit options Discipline Specific Core in MCA (science)

MCA (Ist Semester)

Course type	Course Code	Course Name	Teaching Scheme (Hrs./ week)		Credits Assigned		Total Credits
			Theory	Practical	Theory	Practical	
Major Mandatory (Choose any one from pool of Major courses)	MCA/MJ/500	Mathematical foundation for data science	2	-	2	-	2+2+2+2+ 2+2+2=14
			-	4	-	2	
	MCA/MJ/501	RDBMS	2	-	2	-	
			-	4	-	2	
	MCA/MJ/502	Operating System	2	-	2	-	
			-	4	-	2	
	MCA/MJ/503	Activity-1/Programming 1#	-	4	-	2	
	MCA/MJ/504	Practical based on Mathematical foundation for data science					
	MCA/MJ/505	Practical based on RDBMS					
	MCA/MJ/506	Practical based on Operating System					
	MCA/MJ/507	Practical Based on Programming 1					
DSE (Choose any one from pool of courses)	MCA/DSE/ 520-522	Elective-1#	2	-	2	-	2+2= 04
	MCA/DSE/ 523-525	Practical Based on Elective-1#	-	4	-	2	
RM	MCA/RM/530	**RM-1**	4	-	4	-	04
			12	20	12	10	22 credits

Programming group (Elective 1#) (#Choose any one from Pool /Basket)

Programming Group	Course Code	Activity/Programming- 1
Java Group	MCA/MJ/503/1	Core Java
Microsoft Group	MCA/MJ/503/2	Advanced C++
Open Group	MCA/MJ/503/3	Python

DSC (Elective-I): (#Choose any one from Pool /Basket)

Elective Group	Course Code	Elective 1
Data Science	MCA/DSE/521	Data mining
Security	MCA/DSE/522	Network Security
Pattern Analysis & Machine Intelligence	MCA/DSE/523	Digital Image Processing

MCA (IInd Semester)

Course type	Course Code	Course Name	Teaching Scheme (Hrs./ week)		Credits Assigned		Total Credits
			Theory	Practical	Theory	Practical	
Major Mandatory (Choose any one from pool of Major courses)	MCA/MJ/550	Data structure	2	-	2	-	2+2+2+2+ 2+2+2=14
			-	4	-	2	
	MCA/MJ/551	Software Engineering	2	-	2	-	
			-	4	-	2	
	MCA/MJ/552	Computer Network	2	-	2	-	
			-	4	-	2	
	MCA/MJ/553	Activity-2 / Programming 2#	-	4	-	2	
	MCA/MJ/554	Practical based on Data structure					
	MCA/MJ/555	Practical based on Software Engineering					
	MCA/MJ/556	Practical based on Computer Network					
	MCA/MJ/557	Practical based on Activity-2 / Programming 2					
DSE (Choose any one from pool of courses)	MCA/DSE/ 558-560	Domain Specific Elective-2#	2	-	2	-	2+2= 04
	MCA/DSE/ 561-563	Practical based on Elective 2#	-	4	-	2	
OJT/FP	MCA/DCE/570	OJT/FP	-	4	-	4	04
			08	24	08	14	22 credits

Activity / Programming Group (#Choose any one from Pool /Basket)

Programming Group	Course Code	Activity/Programming-2
Java Group	MCA/MJ/553/1	Advance Java
Microsoft Group	MCA/MJ/553/2	VB.NET
Open Group	MCA/MJ/553/3	Advanced Python

Elective Group (#Choose any one from Pool /Basket)

Elective Group	Course Code	Elective 2
Data Science	MCA/DSE/558	Machine learning
Security	MCA/DSE/559	Cyber Security
Pattern Analysis & Machine Intelligence	MCA/DSE/560	Pattern recognition

MCA (IIIrd Semester)

Course type	Course Code	Course Name	Teaching Scheme (Hrs./ week)		Credits Assigned		Total Credits
			Theory	Practical	Theory	Practical	
Major Mandatory (Choose any one from pool of Major courses)	MCA/MJ/600	Design and analysis of algorithm	2	-	2	-	2+2+2+2+ 2+2+2=14
			-	4	-	2	
	MCA/MJ/601	Artificial Intelligence	2	-	2	-	
			-	4	-	2	
	MCA/MJ/602	Principles of Data Science	2	-	2	-	
			-	4	-	2	
	MCA/MJ/603	Activity-3 / Programming 3 #	-	4	-	2	
	MCA/MJ/604	Practical based on Design and analysis of algorithm					
	MCA/MJ/605	Practical based on Artificial Intelligence					
	MCA/MJ/606	Practical based on Principles of Data Science					
	MCA/MJ/607	Practical based on Activity-3 / Programming 3 #					
DSE (Choose any one from pool of courses)	MCA/DSE/ 608-610	DoElective-3#	2	-	2	-	2+2= 04
	MCA/DSE/ 611-613	Practical based on Elective - 3	-	4	-	2	
RP-1	MCA/RM/605	**RP-1**	-	8	-	4	04
			08	28	08	14	22 credits

Activity/Programming Group (#Choose any one from Pool /Basket)

Programming Group	Course Code	Activity/Programming -3
Java Group	MCA/MJ/603/1	Android
Microsoft Group	MCA/MJ/603/2	C# NET
Open Group	MCA/MJ/603/3	Open Web Programming (PHP)

Elective Group (#Choose any one from Pool /Basket)

Elective Group	Course Code	Elective 3
Data Science	MCA/DSE/608	data warehousing
Security	MCA/DSE/609	Cyber Forensic
Pattern Analysis & Machine Intelligence	MCA/DSE/610	Computer Vision

MCA (IVth Semester)

Course type	Course Code	Course Name	Teaching Scheme (Hrs./ week)		Credits Assigned		Total Credits
			Theory	Practical	Theory	Practical	
Major Mandatory (Choose any one from pool of Major courses)	MCA/MJ/650	Web Technology	2	-	2	-	2+2+2+2+2+2=12
			-	4	-	2	
	MCA/MJ/651	Exploratory data Analysis	2	-	2	-	
			-	4	-	2	
	MCA/MJ/652	Decision support System	2	-	2	-	
			-	4	-	2	
	MCA/MJ/653	Practical on Web Technology					
	MCA/MJ/654	Practical on Exploratory data Analysis					
	MCA/MJ/655	Practical on Decision support system					
DSE (Choose any one from pool of courses)	MCA/DSE/656 -658	Elective-4#	2	-	2	-	2+2= 04
		Practical based on Elective-4	-	4	-	2	
RP-2	MCA/RM/670	**RP-2**	-	12	-	6	06
			08	28	08	14	22 credits

Elective Group

Elective Group	Course Code	Elective 4
Data Science	MCA/DSE/656	Big data analytic
Security	MCA/DSE/657	Cryptography & Block chain
Pattern Analysis & Machine Intelligence	MCA/DSE/658	Open CV

Note: *,# Student is advised to select the any one course from the pool of courses, however horizontal selection of courses to be followed at the time of selection of the course.

OJT/FP: On Job Training / Field Project:

The Students are advised to select the On Job Training / Field Project in any one course from the pool of courses; however the objective is to get an idea about project development in various areas of real life Applications. The training will be for Software project understanding, problem analysis, requirement gathering, requirement analysis, specification, design, coding and implementation in the form of mini and major projects.

Department of Computer Science and Information Technology

MCA (Science)

Semester I Detail Syllabus

NEP Structure for Post Graduate Degree in MCA (Science)

1. Mathematical Foundation for Data Science

COURSE OBJECTIVE

- To introduce the fundamental concepts of linear algebra, probability and statistics required for data and data Science.

Course Title	Mathematical Foundation for Data Science	
Course Practical	Practical based on Mathematical Foundation for Data Science	
Course code	MCA/MJ/500	MCA/MJ/504
Number of Credit	2 Theory	2 Practical

Course Details	Total Contact Hours	Internal Exam Min/Max	External Exam Min/Max
Theory	2hrs/Week	16/40	24/60
Practical	4hrs/Week	8/20	12/30

Prerequisites:

Learning Outcomes: Ability to use the mathematical concepts in the field of data science. Employ the techniques and methods related to the area of data science in variety of applications. Apply logical thinking to understand and solve the problem in context.

Course Outline

UNIT I Mathematical Logic: Statements and notations, Connectives, Well-formed formulas, Truth Tables, tautology, equivalence implication, Normal forms, Quantifiers, universal quantifiers. Predicates: Predicative logic, Free & Bound variables, Rules of inference, Consistency, proof of contradiction, Automatic Theorem Proving. Probability mass, density, and cumulative distribution functions, parametric families of distributions, Expected value, variance, conditional expectation, Applications of the univariate and multivariate Central Limit Theorem, Probabilistic inequalities, Marko chains.

UNIT II Relations: Properties of binary Relations, equivalence, transitive closure, compatibility and partial ordering relations, Lattices, Hash diagram. Functions: Inverse Function, Composition of functions, recursive Functions, Lattice and its Properties, Pigeon hole principles and its application. Elementary Combinatorics : Basics of counting, Combinations & Permutations, with repetitions, Constrained repetitions, Binomial Coefficients, Binomial and Multinomial theorem, the principles of Inclusion– Exclusion.

UNIT III Recurrence Relations: Generating Functions, Function of Sequences, Calculating Coefficients of generating functions, Recurrence relations, solving recurrence relation by substitution and Generating functions, the method of Characteristic roots, solution of non homogeneous Recurrence Relations.

Textbooks:

1. Mathematical Foundation of Computer Science–Shahnaz Bathul, PHI.
2. Elements of Discrete Mathematics- A Computer Oriented Approach,C.L.Liu, D.P. Mohapatra,3edition,TMH.
3. Discrete Mathematics for Computer Scientists & Mathematicians, second edition, J.L.Mott, A.Kandel,T.P. Baker, PHI
4. Discrete and Combinatorial Mathematics- An Applied Introduction-5th Edition– Ralph. P.Grimaldi, Pearson Education.
5. John Vince, Foundation Mathematics for Computer Science, Springer.
6. K. Trivedi. Probability and Statistics with Reliability, Queuing, and Computer Science Applications. Wiley.
7. M. Mitzen macher and E. Upfal. Probability and Computing: Randomized Algorithms and Probabilistic Analysis.
8. Alan Tucker, Applied Combinatorics, Wiley.

2. Relational Database Management System (RDBMS)

COURSE OBJECTIVE

- The Student should able to Design the Databases for corporate sector
- To able to visualize the data, schema and database designing concepts.
- Designing of Database structure and its implementation in real life

Course Title	RDBMS	
Course Practical	Relational Database Management System (RDBMS)	
Course code	MCA/MJ/501	MCA/MJ/505
Number of Credit	2 Theory	2 Practical

Course Details	Total Contact Hours	Internal Exam Min/Max	External Exam Min/Max
Theory	2hrs/Week	16/40	24/60
Practical	4hrs/Week	8/20	12/30

Prerequisites: Basic knowledge of database concepts Tables and files.

Learning Outcomes: The students should get an insight in basic concepts of Data models, views, indexing, and transactions. The concept of concurrency control, deadlock handling and database recovery, System Architecture and distributed databases.

Course Outline

Unit I: Overview of Database Concepts: Introduction, Basic Concepts, View of data, Data models, E-R diagrams, DBA, DB Users, Mapping Cardinalities, Keys, Database Languages, Relational Model: Structure of relational database models, Relational Algebra, Modification of database, Views, SQL: Background, Basic Structure, Different Operations, Functions, Queries, Relations, Views, Indexing and Hashing: Basic Concepts, Indexing, Types of Indexing, Hashing, B +,B-Trees, Static Hashing, Dynamic Hashing. Relational Database Design: Functional Dependencies, Normalization, Types of Normalization, Query Processing: Overview, Transformation of relational expressions, evaluation of expressions, measures of query cost, architecture of query processing model, distributed query processing

Unit II: Transactions: Concept, Transaction States, ACID property, Concept of Serializability, testing for serializability, analysis of different types of schedules like: conflict equivalent, conflict serializable, concept of conflict serializability, etc. Concurrency Control: Protocols for Concurrency control, Timestamp, Lock-based, granting of locks, two phase locking protocol, graph based protocol, etc, Concept of multiple granularity, Deadlock handling. Database Recovery: Failure Classification, Storage structure, recovery and atomicity, check points, types of recovery like, log based recovery, shadow paging etc. Database System Architectures: Centralized Systems, Client-Server systems, parallel and distributed systems, Network types, Distributed Databases: Distributed data storage, data replication, data fragmentation.

Unit III : New Applications: DSS, MIS, Data Mining, Data Warehousing, Types of Databases, New Trends in databases, Introduction to RDBMS: Concept, types, examples, applications.

References:

1. Silberschatz, Korth, & Sudarshan, Database System Concepts,5th edition, McGraw-Hill(2005).
2. Elmasri & Navathe, Fundamentals of Database Systems.
3. Introduction to Database Systems, Bipin C. Desai
4. http://www.bell-labs.com/topic/books/dbbook
5. www.mit.ocw.edu/

Lab Exercise Practical based on basic operators, Set operators, Additional Operators, Aggregate operators in SQL.

3. Operating System

COURSE OBJECTIVE

- The Student should able to Design the Databases for corporate sector
- To able to visualize the data, schema and database designing concepts.
- Designing of Database structure and its implementation in real life

Course Title	Operating System	
Course Practical	Practical based on Operating system	
Course code	MCA/MJ/502	MCA/MJ/506
Number of Credit	**2 Theory**	**2 Practical**

Course Details	Total Contact Hours	Internal Exam Min/Max	External Exam Min/Max
Theory	2hrs/Week	**16/40**	24/60
Practical	4hrs/Week	**8/20**	12/30

Unit I Overview: Introduction, history of operating system, Memory Management: Processes in memory, Logical addresses, Partitions: static versus dynamic, free space management, external fragmentation, Segmented memory, Paged memory: concepts, internal fragmentation, page tables, Demand paging/segmentation, Replacement strategies: FIFO, LRU (and approximations), NRU, LFU /MFU, MRU, Cache Management: Allocation and de-allocation techniques, coherence technique

Unit II Processes and Scheduling: Job/ process concepts, Scheduling basics :CPU-I/O interleaving, non-pre emption, context switching, Scheduling algorithms: FCFS, SJF, SRTF, priority scheduling, round robin, Combined schemes Process details like creation PCB, process view, Thread and inter-process Communication Critical Section Problem, Mutex Locks, Classical Problems of synchronization, Semaphores, Monitors, Priority Boosts in windows, Priority Boosts for Foreground Threads after Waits, Watching Foreground Priority Boosts and Decays, Watching Priority Boosts on GUI Threads, Watching Priority Boosts for CPU Starvation, Principles of Deadlock, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock.

Unit III I/O Management: I/O buffering, Single and Double Buffer schemes, Disk Organization. File Management: File Concepts, File descriptor, Access methods: Sequential, indexed and direct, File sharing, Protection, Access rights, File System structure, Byte Sequence, Record sequence and Tree-based, Recovery and Disk formatting. Secondary Storage Management :File allocation methods: Contiguous Allocation and Non Contiguous allocation, Chained, Indexed allocation, free space management, Disk Scheduling: FCFS, SSTF, SCAN and C- SCAN, Disk Cache. Protection and Security: System performance, protection and security, policies and methods, Access Matrix.

Text Books:

1. Operating Systems Concepts, 8th edition, Abraham Silberschatz, Peter Baer Galvin, Greg Gagne; Wiley

Reference Books:

1. Operating Systems: Internals and Design Principles, 6th edition, William Stallings; Prentice Hall,ISBN-10: 0136006329, Operating Systems, 3rdedition
2. Modern Operating Systems, Andrew S. Tanenbaum; Prentice Hall, ISBN-10: 0-13- 600663-9,2008,3rd edition.

Lab Exercise: At least ten experiments should be carried out on the syllabus by considering the sample experiment list as guidelines:

- Implementing a CPU scheduling policy in a Linux OS.
- Implementing a memory management policy in a Linux OS.
- Implementing a file system in a Linux OS
- Problem of deadlock and/or starvation that can occur when many synchronized threads are competing for limited resources.
- Demonstration the following CPU Scheduling Algorithms FCFS, SJF, Round Robin
- Demonstrate all Page Replacement Algorithms like FIFO, LRU Simulate Bankers algorithm for Deadlock Avoidance, Simulate Bankers Algorithm for dead lock Prevention

4. Activity/Programming-1 Group Core Java

COURSE OBJECTIVE

- The Student should able to Learn Language Programming in Core Java/ Advance C++/ Python
- To able to visualize the data, Program Corporate data needs and process it.

Course Title	Activity/Programming1/Core Java	
Course Practical	Practical based on Core Java	
Course code	MCA/MJ/503/1	MCA/MJ/507/1
Number of Credit	2 Theory	2 Practical

Course Details	Total Contact Hours	Internal Exam Min/Max	External Exam Min/Max
Theory	2hrs/Week	16/40	24/60
Practical	4hrs/Week	8/20	12/30

A)Course Outline: Java Group (Core Java)

Unit 1: Java Basics: Introduction to Java, Features & Properties, Program Structure, IDE platforms available for writing & Compiling java programs, Define the scope of variable, Define structure of Java Classes, executing java program from command line, Writing classes, declaring members and behaviors of class. Variable Scope. Working with Java Data types.

Unit 2: Working with Data Types : Declare and Initialize Java variables, Primitive Data types, Number Classes, Operators – classification of operators, type of operators, arithmetic, assignment, unary Operators, equality, relational, conditional operators, bitwise, bit shift operators, expressions, statements and blocks.

Creating and using arrays, vectors. Conditional and Looping Constructs – *if, if-else, switch, for, while, dowhile, foreach* and branching statements (*break, continue*). Creating and using packages.

Unit 3:Object Oriented Principals in Java - **Encapsulation** – create methods with arguments and return values, including overloaded methods, use of static keyword to members and methods, **Polymorphism** - create overloaded methods, define constructor, default and user defined constructors, constructor overloading, inner classes, nested classes, passing information to method or constructor. **Inheritance** – Hiding methods, controlling access to members of class, method overriding, use of *super* and *this* keyword to access object and constructors, defining and using abstract class, abstract methods and interfaces, *final* and *finalize*.

Web Resource https://docs.oracle.com/javase/tutorial/tutorialLearningPaths.html

Books:

1. Core Java, Vol I & II, Sun Press
2. Java 2 Complete Reference by Herbert Schildt, McGraw Hill Publications
3. Java How to Program by Dietal & Dietal
4. Java Certification Guide - Symon Roberts
5. Java Programming Language – James Gosling

Elective 2: Advance C++

COURSE OBJECTIVE

- The Student should able to Learn Language Programming in Advance C++
- To able to design and develop C++ applications.

Course Title	Activity/Programming1/Advance C++	
Course Practical	Practical based on Advance C++	
Course code	MCA/MJ/503/2	MCA/MJ/507/2
Number of Credit	**2 Theory**	**2 Practical**

Course Details	Total Contact Hours	Internal Exam Min/Max	External Exam Min/Max
Theory	2hrs/Week	**16/40**	24/60
Practical	4hrs/Week	**8/20**	12/30

B)Course outline: Microsoft Group (Advanced C++)

Unit 1: Fundamentals, types, constants, and Variables, using functions, input, output streams, Operators and fundamental types, control flow – while, for, do-while, if-else, conditional expressions, selecting switch, jumps, breaks, continue and goto, Symbolic constant and Macros – Macros, Macros with parameters, working with #define directive, conditional inclusions, standard macros for character manipulations.

Unit 2: Writing Functions and Classes: Functions – Significance, defining function, return value of function, passing arguments. Writing classes – defining classes, defining methods, defining objects, using objects, pointers to objects, constructors, constructor calls, destructors, this pointer, passing objects as arguments, structs, unions, Inline functions, overloading functions, Storage classes and namespaces – static, extern, auto and register, using keyword. Abstract Classes – pure virtual methods, abstract and concrete classes, virtual assignment,

Unit 3: Arrays and Pointers : Arrays – Defining, initializing, Class array, multidimensional array, Member arrays, Arrays and Pointers, Pointer Arithmetic, Arrays as arguments, pointer version of function, read-only pointers, returning pointers, pointers and reference to abstract classes, .

1. A complete guide to programming in C++ by Ulla Kirch-Prinz, Peter Prinz
2. C++ by Dissection by Ira Pohl
3. C++ Complete Reference by Herbert Schieldt

Practical's: Students are required to complete minimum 2 practical's on each unit in addition to the assignments published by the teacher on notice board / during practical's etc..

Elective 3: Python

COURSE OBJECTIVE

- The Student should able to Learn Language Programming in Python
- To able to visualize the data, Programming in Python with all its functions and features.

Course Title	Activity/Programming1/Python	
Course Practical	Practical based on Python	
Course code	MCA/MJ/503/1	MCA/MJ/507/1
Number of Credit	**2 Theory**	**2 Practical**

Course Details	Total Contact Hours	Internal Exam Min/Max	External Exam Min/Max
Theory	2hrs/Week	**16/40**	24/60
Practical	4hrs/Week	**8/20**	12/30

C)Course Outline : Open Group (Python)

Unit-1:

Getting started with python: Python features, python environment, configuration and installation, python interpreter, interactive mode. **Data types and Operations:** Core data types, Numbers, Strings, Lists, Dictionaries, Tuples, files and others.

Statement and Syntax: python statements, assignments, expression and prints, conditional statements if, multiway branching, **Looping Controls:** while, for, loop coding techniques, **Iterations and Comprehension.** Iterators, Lists Comprehension, Range iterators, the map, zip and filter iterators, multiple vs single iterator, generators, timing iterators. **Functions:** scope, arguments, types of functions, recursion, function objects, anonymous function, Modules

Unit-2:

Exception Handling: exceptions, default exception handler, catching exception, raising exception, user defined exceptions, termination action. **Exception coding** details: try/except/else statement, try statement, try else clause, try/finally statement, unified try/except/finally statement, raise statement, assert statement. **Exception Objects:** exception hierarchy, built-in exceptions, nesting exceptions, designing exceptions.

Unit-3:

Classes and OOP: class statement, constructors and expressions, methods, Inheritance, Multiple inheritance (Is-a, Has-a), static, decorators, metaclasses, Namespaces. **Operator overloading:** indexing and slicing, memberships, attribute reference. Delegation, Extending Built-in types, User Defined Modules.

Reference Books:

Learning Python, 5th Edition, powerful Object-Oriented Programming, By Mark Lutz, and Publisher: O'Reilly Media, Final Release Date: June 2013

E-books:

1.Python Book(http://upload.wikimedia.org/wikipedia/commons/9/91/Python_Programming.pdf)http://pythonbooks.revolunet.com/

Practical's: Students are required to complete minimum 2 practical's on each unit in addition to the assignments published by the teacher on notice board / during practical's etc..

Elective I

COURSE OBJECTIVE

- The Student should able to Learn the concept of Data mining and its role in Data Application and Management.
- To learn Data mining technology and implement it.

Course Title	Domain Specific Elective - 1# Data Mining	
Course Practical	Practical based on Data mining	
Course code	MCA/DSE/520	MCA/DSE/523
Number of Credit	**2 Theory**	**2 Practical**

Course Details	Total Contact Hours	Internal Exam Min/Max	External Exam Min/Max
Theory	2hrs/Week	**16/40**	24/60
Practical	4hrs/Week	**8/20**	12/30

Elective – I (Data mining)

Elective Group	Elective – I Subjects
Data Science	Data mining
Security	Network Security
Pattern Analysis & Machine Intelligence	Digital Image Processing

Data Mining

Unit-1: Introduction to Data Mining, Related technologies - Machine Learning, DBMS, OLAP, Statistics, Data Mining Goals, Stages of the Data Mining Process, Data Mining Techniques, Knowledge Representation Methods, Applications, Example: weather data.

Unit-2: Data Warehouse and OLAP, Data Warehouse and DBMS, Multidimensional data model, OLAP operations, Example: loan data set, Data preprocessing, Data cleaning, Data transformation, Data reduction, Discretization and generating concept hierarchies, Installing Weka 3 Data Mining System, Experiments with Weka - filters, discretization

Unit-3: Data mining knowledge representation, Task relevant data, Background knowledge, Interestingness measures, Representing input data and output knowledge, Visualization techniques, Experiments with Weka – visualization. Data mining algorithms: Association rules, Motivation and termir ology, Example: mining weather data, Basic idea: item sets, Generating item sets and rules efficientl y, Correlation analysis, Experiments with Weka - mining association rules.

Textbook / Reference Book:

- Han, J. and Kamber, M., Data Mining: Concepts and Techniques, 2nd Edition, Morgan Kaufmann, 2006

Other Materials:

- P. Tan, M. Steinbach and V. Kumar, Introduction to Data Mining, Addison Wesley, 2006.
- Related papers from various conferences and journals will be provided by the instructor.

Web Link:

- http://academic.csuohio.edu/fuy/EEC%20525/syllabus.html
- http://academic.csuohio.edu/fuy/ECE 525
- http://www.cs.ccsu.edu/~markov/ccsu_courses/580Syllabus.html
- http://academic.csuohio.edu/fuy/EEC%20525/syllabus.html

Elective – I (Network Security)

COURSE OBJECTIVE

- The Student should able to Learn Elective subject of Data mining and its role in Data Management.
- To learn Data mining technology and implement it with knowledge and application

Course Title	Domain Specific Elective - 1# Network Security	
Course Practical	Practical based on Network Security	
Course code	MCA/DSE/521	MCA/DSE/523
Number of Credit	2 Theory	2 Practical

Course Details	Total Contact Hours	Internal Exam Min/Max	External Exam Min/Max
Theory	2hrs/Week	16/40	24/60
Practical	4hrs/Week	8/20	12/30

Unit I:

Introduction: Security Attacks, Security Services, Integrity check, digital Signature, authentication, has algorithms. Secret Key Cryptography: Block Encryption, DES rounds, S-Boxes IDEA: Overview, comparison with DES, Key expansion, IDEA rounds, Uses of Secret key Cryptography; ECB, CBC, OFB, CFB, Multiple encryptions DES. Hash Functions and Message Digests: Length of hash, uses, algorithms (MD2, MD4, MD5, SHS) MD2: Algorithm (Padding, checksum, passes.) MD4 and 5: algorithm (padding, stages, digest computation.) SHS: Overview, padding, stages.

Unit II

Public key Cryptography: Algorithms, examples, Modular arithmetic (addition, multiplication, inverse, and exponentiation) RSA: generating keys, encryption and decryption. Other Algorithms: PKCS, Diffie-Hellman, El-Gamal signatures, DSS, Zero-knowledge signatures. Authentication: Password Based, Address Based, Cryptographic Authentication. Passwords in distributed systems, on-line vs offline guessing, storing. Cryptographic Authentication: passwords as keys, protocols, KDC's Certification Revocation, Interdomain, groups, delegation. Authentication of People: Verification techniques, passwords, length of passwords, password distribution, smart cards, biometrics. Security Policies and Security Handshake Pitfalls: What is security policy, high and low level policy, user issues? Protocol problems, assumptions, Shared secret protocols, public key protocols, mutual authentication, reflection attacks, use of timestamps, nonce and sequence numbers, session keys, one-and two-way public key based authentication.

Unit III

. Example System: 2 Kerberos: purpose, authentication, serer and ticket granting server, keys and tickets, use of AS and TGS, replicated servers. Kerberos V4: names, inter-realm authentication, Key version numbers. Kerberos V5: names, realms, delegation, forwarding and proxies, ticket lifetimes, revoking tickets, multiple Realms. Network Security: Electronic mail security, IP security, Network management security. Security for electronic commerce: SSL, SET .System Security: Intruders and Viruses, Firewalls, Intrusion Detection

Tutorials: 1. Numerical problems on DE, IDEA, MD2, MD5, Diffie-Helman and El-Gamal Signatures.
2. Comparative study of network security tools.
3. Vulnerability tools: Nessus, Retina, Wireshark, Nmap.
4. Packet Sniffers: Tcpdump, Ettercap, Dsniff.

Term Work: Term work/Assignment: Each candidate will submit a journal in which at least 10 assignments based on the above syllabus and the internal test paper. Test will be graded for 10 marks and assignments will be graded for 15 marks.

References:

1. Atul Kahate, Cryptography and Network Security, McGraw Hill.
2. Kaufman, c., Perlman, R., and Speciner, M., Network Security, Private Communication in a public world, 2nd ed., Prentice Hall PTR., 2002.
3. Stallings, W.,.Cryptography and Network Security: Principles and Practice, 3rd ed., Prentice Hall PTR.,2003. 4. Stallings, W. Network security Essentials: Applications and standards, Prentice Hall, 2000.
5. Cryptography and Network Security; McGraw Hill; Behrouz A Forouzan.

Elective I: (Digital Image Processing)

COURSE OBJECTIVE

- The Student should able to Learn Image Processing.
- learn Transformations and plotting of image, Transformation functions

Course Title	Domain Specific Elective - 1# Digital Image Processing	
Course Practical	Practical based on Image Processing	
Course code	MCA/DSE/523	MCA/DSE/525
Number of Credit	**2 Theory**	**2 Practical**

Course Details	Total Contact Hours	Internal Exam Min/Max	External Exam Min/Max
Theory	2hrs/Week	**16/40**	24/60
Practical	4hrs/Week	**8/20**	12/30

- Image Processing

Unit 1: Introduction, Fundamentals, Digital Image Representation, Image Types, Converting between Classes, Array Indexing.

Unit 2: Intensity Transformations and Spatial Filtering, Intensity Transformation Functions, Histogram Processing and Function Plotting, Spatial Filtering, Using Fuzzy Techniques for Intensity Transformations and Spatial Filtering.

Unit 3: Filtering in the Frequency Domain, The 2-D Discrete Fourier Transform, Obtaining Frequency Domain Filters from Spatial Filters, Generating Filters Directly in the Frequency Domain, Highpass (Sharpening) Frequency Domain Filters, Selective Filtering.

Unit 4: Image Restoration and Reconstruction, A Model of the Image Degradation/Restoration Process, Noise Models, Restoration in the Presence of Noise Only—Spatial Filtering, Periodic Noise Reduction Using Frequency Domain Filtering, Modeling the Degradation Function, Direct Inverse Filtering, Wiener Filtering, Constrained Least Squares (Regularized) Filtering, Iterative Nonlinear Restoration Using the LucyRichardson Algorithm, Blind Deconvolution, Image Reconstruction from Projections.

Unit 5: Geometric Transformations and Image Registration, Transforming Points, Affine Transformations, Projective Transformations, Applying Geometric Transformations to Images, Image Coordinate Systems, Image Interpolation, Image Registration.

References:

- Digital Image Processing Using MATLAB®, Second Edition, Rafael C. Gonzalez, Richard E. Woods, Steven L. Eddins, The MathWorks, Inc. ISBN number 9780982085400, Publisher: Gatesmark Publishing, 2009.

Web Link: http://imageprocessingplace.com/DIPUM-2E/dipum2e_main_page.htm

NEP Structure for Post Graduate Degree in MCA (Science)

MCA Semester – II

MCA (IInd Semester)

Course type	Course Code	Course Name	Teaching Scheme (Hrs./ week)		Credits Assigned		Total Credits
			Theory	Practical	Theory	Practical	
Major Mandatory (Choose any one from pool of Major courses)	MCA/MJ/550	Data structure	2	-	2	-	2+2+2+2+ 2+2+2=14
			-	4	-	2	
	MCA/MJ/551	Software Engineering	2	-	2	-	
			-	4	-	2	
	MCA/MJ/552	Computer Network	2	-	2	-	
			-	4	-	2	
	MCA/MJ/553	Activity-2 / Programming 2#	-	4	-	2	
	MCA/MJ/554	Practical based on Data structure					
	MCA/MJ/555	Practical based on Software Engineering					
	MCA/MJ/556	Practical based on Computer Network					
	MCA/MJ/557	Practical based on Activity-2 / Programming 2					
DSE (Choose any one from pool of courses)	MCA/DSE/ 558-560	Domain Specific Elective-2#	2	-	2	-	2+2= 04
	MCA/DSE/ 561-563	Practical based on Elective 2#	-	4	-	2	
OJT/FP	MCA/DCE/570	OJT/FP	-	4	-	4	04
			08	24	08	14	22 credits

Activity / Programming Group (#Choose any one from Pool /Basket)

Programming Group	Course Code	Activity/Programming-2
Java Group	MCA/MJ/553/1	Advance Java
Microsoft Group	MCA/MJ/553/2	VB.NET
Open Group	MCA/MJ/553/3	Advanced Python

Elective Group (#Choose any one from Pool /Basket)

Elective Group	Course Code	Elective 2
Data Science	MCA/DSE/558	Machine learning
Security	MCA/DSE/559	Cyber Security
Pattern Analysis & Machine Intelligence	MCA/DSE/560	Pattern recognition

1. Data Structure

COURSE OBJECTIVE

- To introduce the Concept of Data Structure
- Elementary Data organization
- Sequencing of data and sorting

Course Title	Data Structure	
Course Practical	Practical based on Data Structure	
Course code	MCA/MJ/550	MCA/MJ/554
Number of Credit	2 Theory	2 Practical

Course Details	Total Contact Hours	Internal Exam Min/Max	External Exam Min/Max
Theory	2hrs/Week	16/40	24/60
Practical	4hrs/Week	8/20	12/30

1. Data Structure

Unit– I Introduction: Basic Terminology, Elementary Data Organization, Algorithm, Efficiency of an Algorithm, Time and Space Complexity, Asymptotic notations: Big-Oh, Time-Space trade-off. Abstract Data Types (ADT) Arrays: Definition, Single and Multidimensional Arrays. Linked lists: Array Implementation and Dynamic Implementation of Singly Linked Lists, Doubly Linked List, Circularly Linked List, Operations on a Linked List. Insertion, Deletion, Traversal, Polynomial Representation and Addition, Generalized Linked List. Stacks: Abstract Data Type, Primitive Stack operations: Push & Pop, Array and Linked Implementation of Stack in C, Application of stack: Prefix and Postfix Expressions, Evaluation of postfix expression, Recursion, Tower of Hanoi Problem, Simulating Recursion, Principles of recursion, Tail recursion, Removal of recursion Queues, Operations on Queue: Create, Add, Delete, Full and Empty, Circular queues, Array and linked implementation of queues in C, De queue and Priority Queue.

Unit – II Trees: Basic terminology, Binary Trees, Binary Tree Representation: Array Representation and Dynamic Representation, Complete Binary Tree, Extended Binary Trees, Array and Linked Representation of Binary trees, Tree Traversal algorithms: In order, Preorder and Post order, Threaded Binary trees, Traversing Threaded Binary trees, Huffman algorithm. Graphs: Terminology, Sequential and linked Representations of Graphs: Adjacency Matrices, Adjacency List, Adjacency Multi list, Graph Traversal: Depth First Search and Breadth First Search, Connected Component, Spanning Trees, Minimum Cost Spanning Trees: Prims and Krusk alalgorithm. Shortest Path algorithm: Warshal Algorithm and Dijikstra Algorithm.

Unit–III Searching: Sequential search, Binary Search, Comparison and Analysis Internal Sorting: Insertion Sort, Selection, Bubble Sort, Quick Sort, Merge Sort, Heap Sort, Radix Sort. Search Trees: Binary Search Trees (BST), Insertion and Deletion in BST, AVL trees, introduction to m-way Search Trees, B Trees& B+ Trees Hashing: Hash Function, Linear probing.

Text/References Books:

1. Aaron M. Tenenbaum, Yedidyah Langsam and MosheJ. Augenstein "Data Structures Using C and C++", PHI.
2. Horowitz and Sahani," Fundamentals of Data Structures", Galgotia Publication.
3. Jean Paul Trembley and Paul G. Sorenson, "An Introduction to Data Structures with applications" Mc Graw Hill.
4. R. Kruseetal, "Data Structures and Program Design in C", Pearson Education
5. Lipschutz, "DataStructures" Schaum's Outline Series,TMH
6. GAVPai,"Data Structures and Algorithms",TMH

Lab Exercise:

Practical based on Data Structure using C++: At least two experiments should be carried out on each unit.

2. Software Engineering

COURSE OBJECTIVE

- Study of Software Engineering concepts
- Requirement Analyses, Designing, coding methods and process
- Software Cost Estimations

Course Title	Software Engineering	
Course Practical	Practical based on Software Engineering	
Course code	MCA/MJ/551	MCA/MJ/555
Number of Credit	**2 Theory**	**2 Practical**

Course Details	Total Contact Hours	Internal Exam Min/Max	External Exam Min/Max
Theory	2hrs/Week	**16/40**	24/60
Practical	4hrs/Week	**8/20**	12/30

Unit1:

Software problems, process and project, Software development process models like water fall model, prototype model, time boxing model, Extreme programming and Agile processes, Project management process. Software requirements analysis and specification, Value of a good SRS, Requirement process, requirement specification, Characteristics and components of SRS, Functional Specifications with Use Cases, DFD, E-R diagrams, Role of software architecture, Architecture Styles for C & C view, Documenting and evaluating architecture design.

Unit II:

Project schedule and staffing, Top-down and Bottom-up Effort Estimation approach, Risk assessment and management, Software design concepts, cohesion and coupling, Function oriented design, Object oriented design, UML. Coding standards, Programming principles and guidelines, Structured programming, Incremental Coding Process, Pair Programming, Refactoring, Code inspection, Complexity metrics.

Unit III:

Testing concepts, Error, Fault and Failure, Test case, Test suits, Test plan, Test Case design, Test case execution, Black box testing, equivalence Class partitioning, Boundary Value analysis, White Box testing, Control Flow based criteria, Software reliability , defect removal efficiency, Software maintenance and its types.

References:

1. Software Engineering: A Precise Approach by Pankaj Jalote
2. Software Engineering: Practitioners approach by Press men

3. Computer Network

COURSE OBJECTIVE

- Study of Software Engineering concepts
- Requirement Analyses, Designing, coding methods and process
- Software Cost Estimations

Course Title	Computer Network	
Course Practical	Practical based on Computer Network	
Course code	MCA/MJ/552	MCA/MJ/556
Number of Credit	2 Theory	2 Practical

Course Details	Total Contact Hours	Internal Exam Min/Max	External Exam Min/Max
Theory	2hrs/Week	16/40	24/60
Practical	4hrs/Week	8/20	12/30

Unit 1:

Overview Data communications, components, data representations, data flows. Networks: Distributed processing, network criteria, physical structures, network models, interconnection of networks. Protocol and standards: Protocol, standards, standard organization, internet standards. Layered tasks sender, receiver, carrier and hierarchy. Models: OSI, Layer in OSI Model, TCP/IP protocol suite, addressing. Data and Signals: Analog and Digital Signal, Periodic analog signal, Digital Signal, Data rate limits, performance: bandwidth, throughputs, latency (delay), bandwidth-delay, Jitter. Digital Transmission: digital to digital conversion - Line coding scheme, block coding, analog-to-digital conversion–pulse code modulation, delta modulation. Transmission mode – parallel and serial transmission. Analog Transmission: digital to analog conversion – amplitude shift keying, frequency shift keying, and phase shift keying. Analog to analog conversion – Amplitude modulation, frequency modulation, phase modulation,

Unit 2:

Transmission media Guided media–twisted pair, coaxial cable, fiber optic cable, un-guided media–radio waves , microwaves, infrared. Switching–circuits witched networks, datagram networks, virtual circuit networks. Error detection and correction: type of errors, redundancy, detection versus correction, forward error correction versus retransmission. Block coding, linear lock coding , cyclic codes, checksum. Data link controls – framing, flow and error control, protocols – noisy channel, HDLC, point-to-point protocol. Random Access–ALOHA,CSMA, CSMA/ CD, CSMA /CA, Controlled Access - reservation, polling, token passing. Channelization–FDMA, TDMA, CDMA

Unit 3:

Network Layer and Application layer Logical addressing, IPV4 Addressing, IPV6 Addressing, Interne Protocol–transition from IPv4, IPv6, Address mapping, Error reporting and multicasting–ICMP,IGMP,ICMPv6. Delivery Forwarding and routing – delivery, forwarding, Uni cast routing protocol, multicast routing protocol. Transport Layer –Process to process delivery, User datagram protocol, Congestion control and quality of service – open and closed loop congestion. Domain Name system - Name space, domain name space, Distribution of name space, DNS messages, types of records, Remote login, Electronic mail and File transfer protocol–Telnet, Email Architecture – agents, SMTP, POP and IMAP. WWW and HTTP – architecture, web documents. Security in the internet – IPSec, SSL/TLS,PGP, VPN and Firewalls.

Text Books

1. Data Communication and networking by Behrouz A Forouzan, Mc Graw Hill Publications
2. Data and Computer Communications by William Stallings, LPE Publications.

Lab Exercise:

Students are required to implement programs for data transmission (Chat) applications using socket programming, file transfer application, error detection and correction.

4. Activity/Programming-2 Group Advance Java

COURSE OBJECTIVE

- The Student should able to Learn Language Programming in Advance Java
- To able to visualize the data, Program Corporate data needs and process it.

Course Title	Activity/Programming 2 / Advance Java	
Course Practical	Practical based on Core Java	
Course code	MCA/MJ/553/1	MCA/MJ/507/1
Number of Credit	2 Theory	2 Practical

Course Details	Total Contact Hours	Internal Exam Min/Max	External Exam Min/Max
Theory	2hrs/Week	16/40	24/60
Practical	4hrs/Week	8/20	12/30

Activity/Programming – 2 Group

Programming Group

1. **Java Group** : Advance Java
2. **Microsoft Group** : VB.NET
3. **Open Group** : Advance Python

A)Course Outline : Java Group (Advance Java)

Unit 1: Collections : Collection Interfaces, Concrete Collections, The Collections Framework **Multithreading** : Creating thread and running it, Multiple Thread acting on single object, Synchronization, Thread communication, Thread group, Thread priorities, Daemon Thread, Life Cycle of Thread, **Networking** - Internet Addressing, InetAddress, Factory Methods, Instance Methods, TCP/IP Client Sockets, URL, URL Connection, TCP/IP Server Sockets, Datagrams

Unit 2: Java Database Connectivity - Merging Data from Multiple Tables: Joining, Manipulating Databases with JDBC, Prepared Statements, Transaction Processing, Stored Procedures C. **Remote Method Invocation:** Defining the Remote Interface, Implementing the Remote Interface, Compiling and Executing the Server and the Client

Unit 3: Servlets: Servlet Overview and Architecture, Interface Servlet and the Servlet Life Cycle, Handling HTTP get Requests, Handling HTTP post Requests, Redirecting Requests to Other Resources, Session Tracking, Cookies, Session Tracking with HttpSession **Java Server Pages (JSP):** Introduction, JavaServer Pages Overview, A First JavaServer Page Example, Implicit Objects, Scripting, Standard Actions, Directives, Custom Tag Libraries

Introduction Smart Phone Application Development: Introduction to android platform, Creating application template, adding activity, intent, services to application, using Google map API

Reference Book:

1. "Advanced Java 2 Platform HOW TO PROGRAM" by H. M.Deitel, P. J. Deitel, S. E. Santry – Prentice Hall
2. "Beginning Java™ EE 6 Platform with GlassFish 3 From Novice to Professional" by Antonio Goncalves – Apress publications

Microsoft group VB.Net

COURSE OBJECTIVE

- The Student should able to Learn Language and Programming in VB.Net
- To able to do Object oriented programming in VB.net

Course Title	Activity/Programming 2 / VB.Net	
Course Practical	Practical based on Core Java	
Course code	MCA/MJ/553/2	MCA/MJ/507/2
Number of Credit	**2 Theory**	**2 Practical**

Course Details	Total Contact Hours	Internal Exam Min/Max	External Exam Min/Max
Theory	2hrs/Week	**16/40**	24/60
Practical	4hrs/Week	**8/20**	12/30

B)Course Outline : Microsoft Group (VB.NET)

Unit-1:

Getting Started: Microsoft Visual Studio .NET Architecture, Application in Visual Basic .NET, Basic .NET Concepts, Exploring the Development Environment, Creating a Visual Basic .NET Projects. **Using Variables and Arrays:** Introduction to Data Types, Using Variables, Variable Scope, Converting Data Types, Creating and Using Structures, Storing Data in Arrays

Working with Procedures: Creating Procedures, Using Procedures, Using Predefined Functions, **Decision Structures and Loops:** Using Conditional Expressions, Using Decision Structures, Using Conditional Loop Structures. **Validating User Input:** Restricting User Input, Validating Field Data, Validating Form Data

Unit-2:

Object-oriented Programming in Visual Basic .NET: Understanding Classes, Working with Classes, Using Shared Members, Inheritance, Polymorphism, and Namespaces **Handling Errors and Exceptions:** Types of Errors, Using the Debugger and Handling Exceptions.

Working with Forms and Controls: Understanding Programming Concepts, Working with Windows Forms Working with Controls, Styling Your Code. **Enhancing the User Interface:** Creating Menus, Creating Status Bars. Creating Toolbars.

Unit-3:

Using ADO.NET: Database Concepts, Overview of ADO.NET, Overview of MySQL, Working with Database using MySQL, Create Insert, delete Table commit etc. Deploying Applications: Introduction to Deployment, Deploying a Windows-based Application

Reference Books:

1. Steven holzner, Visual basic .net programming black book, Wiley publishing.
2. Heinrich Gantenbein, Microsoft Visual Basic .NET 2003 Unleashed

E-Books:

http://www.tutorialspoint.com/mysql/mysql_tutorial.pdf

Open group (Advance Python)

COURSE OBJECTIVE

- The Student should able to Learn Language and Programming in VB.Net
- To able to do Object oriented programming in VB.net

Course Title	Activity/Programming 2 / Advance Python	
Course Practical	Practical based on Advance python	
Course code	MCA/MJ/553/3	MCA/MJ/507/3
Number of Credit	2 Theory	2 Practical

Course Details	Total Contact Hours	Internal Exam Min/Max	External Exam Min/Max
Theory	2hrs/Week	16/40	24/60
Practical	4hrs/Week	8/20	12/30

C) Course Outline : Open Group (Advanced Python)

Unit-1:

Threads: Introduction to Threads, thread organization, thread architectures, starting new thread, thread modules, Creating thread using Threading module, Synchronising threads. Controlling access to resources. GUI Design using TkInter or jython: Introduction, Layout Management, Widgets, Menus and Toolbars, Dialog boxes, Drawings, Nibbles. Database Programming using python (MySql): Python Database Interfaces and APIs, Database Connections, Creating Table, Insert Operation, Read operation, Update and Delete Operation, Performing Transactions, Commit & Rollback Operations, Handling Errors.

Unit-2:

Web Framework using Web.py: Introduction, URL Handling, GET and POST method, difference between GET and POST, Configuring server, starting server, Templating, Forms, Databashing, development
Web socket programming and Web services: Introduction, About Sockets, socket module, types of sockets, Server Socket Methods, Client Socket Method, Design of simple server and client, python internet modules, HTTP web services: features of HTTP, using web services, debugging web services, setting user agents, handling redirects, handling compressed data.

Unit-3:

FLASK framework: Introduction, Exploring FLASK, Coding Conventions, Environment, configuration, organizing project, handling templates, files, handling forms, deployments.

Reference Books:

1.Python 3 Web Development Guide, Michel Anders, Beginners guide, PACKT Publishing, open source.

E-books: -

- Python Threading:
  - http://www.tutorialspoint.com/python/python_multithreading.htm
  - http://pymotw.com/2/threading/
  - http://www.python-course.eu/threads.php
- GUI:
  - https://wiki.python.org/moin/TkInter
  - https://wiki.python.org/jython/LearningJython
  - http://www.tutorialspoint.com/python/python_gui_programming.htm
- Database:
  - Python MySQL API https://wiki.python.org/moin/DatabaseInterfaces
  - http://www.tutorialspoint.com/python/python_database_access.htm
- Web Framework: http://webpy.org/docs/0.3/tutorial
- Python webSocket:
  - http://www.tutorialspoint.com/python/python_networking.htm
  - https://docs.python.org/2/howto/sockets.html
  - https://docs.python.org/3.0/library/socket.html
  - http://www.diveintopython.net/http_web_services/index.html
- FLASK framework, http://www.fullstackpython.com/flask.html

Elective II (Machine Learning)

COURSE OBJECTIVE

- The Student should able to learn the Algorithmic models of Learning
- To learn Computational learning theory and Data visualition.

Course Title	Domain Specific Elective - 2# Machine Learning	
Course Practical	Practical based on Data mining	
Course code	MCA/DSE/558	MCA/DSE/523
Number of Credit	2 Theory	2 Practical

Course Details	Total Contact Hours	Internal Exam Min/Max	External Exam Min/Max
Theory	2hrs/Week	16/40	24/60
Practical	4hrs/Week	8/20	12/30

B)Course Outline : CSC432 - Machine Learning

Unit 1: Algorithmic models of learning - Learning classifiers, functions, relations, grammars, probabilistic models, value functions, behaviors and programs from experience. Bayesian, maximum a posteriori, and minimum description length frameworks.

Unit 2: Parameter estimation : sufficient statistics, decision trees, neural networks, support vector machines, Bayesian networks, bag of words classifiers, N-gram models; Markov Chains and Hidden Markov models, probabilistic relational models, association rules, nearest neighbor classifiers, locally weighted regression, ensemble classifiers.

Unit 3: Computational learning theory, mistake bound analysis, sample complexity analysis, VC dimension, Occam learning, accuracy and confidence boosting. Dimensionality reduction, feature selection and visualization.

Unit 4: Data Visualization and Reinforcement learning: Clustering, mixture models, k-means clustering, hierarchical clustering, distributional clustering. Reinforcement learning; Learning from heterogeneous, distributed, data and knowledge.

Unit 5: Selected applications - data mining, automated knowledge acquisition, pattern recognition, program synthesis, text and language processing, internet-based information systems, human-computer interaction, semantic web, and bioinformatics and computational biology.

Text Book

- Pattern Recognition and Machine Learning. By Bishop, C. (2006). Berlin: Springer-Verlag,
- Pattern Classification by Duda, R., Hart, P., and Stork, D. (2001). New York: Wiley.
- The elements of Statistical Learning - Data Mining, Inference, and Prediction. Berlin: Hastie, T., Tibshirani, R., and Friedman, J. (2001). Springer-Verlag

Online Web Reference

http://web.cs.iastate.edu/~cs573x/syllabus.html

Study Guide http://web.cs.iastate.edu/~cs573x/studyguide.html

Elective II (Cyber Security)

Course Outline

Prerequisites: There are no perquisites required for attending this course

COURSE OBJECTIVE

- Responding

[redacted]

Course Title	Domain Specific Elective - 2# Cyber Security	
Course Practical	Practical based on Cyber Security	
Course code	MCA/DSE/559	MCA/DSE/562
Number of Credit	2 Theory	2 Practical

Course Details	Total Contact Hours	Internal Exam Min/Max	External Exam Min/Max
Theory	2hrs/Week	16/40	24/60
Practical	4hrs/Week	8/20	12/30

[redacted]

Introduction to Cyber Crime: Cyber Crime and Information Security, Classification of Cyber crime-Email Spoofing, Spamming, Internet Time Theft, Salami Attack, Data Hacking, Credit Card Frauds, Identity Theft, Password Sniffing, Software Piracy, Web Jacking, Forgery, Online Frauds. Information Security Concepts :Information Security Overview , Information Security Services ,Goals for Security, E-commerce security, Computer Forensics, Digital Forensics Science, Digital Forensics Life Cycle.

Unit 2: Preserving and creating controlled environment for Digital evidence

Phishing and Identity Theft :Methods of Phishing, Phishing Techniques, Spear phishing, Types of phishing scams, Phishing Toolkits and Spy Phishing, Phishing Countermeasures, Identity Theft, Types and Techniques of identity thefts and its counter measures. Security Threats and Vulnerabilities :Overview of Security threats, Attacks, Hacking Techniques, Insecure Network connections.

Unit

[redacted]

Privacy Control Concept: What is Privacy? Methods to control Privacy, Data Collection from Social Networks, Challenges, Opportunities and pitfalls in securities, Credibility and reputation in social system. Privacy policing and preserving. Information Privacy disclosure, revelation and its effect in OSM and networks. Access Control and Intrusion Detection :Overview of Authentication and Authorization, Overview of Intrusion Detection System, IDS Types and Detection Models, IDS Features and Intrusion Prevention Systems

Unit 3

Cybercrimes and Cyber Security: The Legal Perspectives Indian Context, The Indian IT Act – Positive Aspect of the ITA 2000, Weak Areas of ITA 2000.Legal, Ethical and Professional Issues in Information Security: Laws and Ethics in information Security, Relevant (Indian/US) Laws, Ethics and Information Security, Codes of Ethics and Professional Organization. Open source: IPV4, IPV6, IP assigning, MAC, Bridging, Raid protocols, Linux remote connection: (Remote login, transfer file), Remote session(OpenSSh Configuration), Logs introduction, log files(Messages, dmesg, Audit log), cron.

Reference Books :

1. Rhodes-Ousley, Mark. Information Security: The Complete Reference, Second Edition,
2. Information Security Management: Concepts and Practice. New York, McGraw-Hill, 2013.
3. Whitman, Michael E. and Herbert J. Mattord. Roadmap to Information Security for IT and InfoSec Managers. Boston, MA: Course Technology, 2011.
4. Nina Godbole and SunitBelapure ,Cyber Security, by, Wiley Publication
5. Gray Hat Hacking: The Ethical Hackers' Handbook, Shon Harris, Allen Harper, Chris Eagle and Jonathan Ness, TMH Edition .

E-Resources:

https://www.cyberdegrees.org/resources/free-online-courses/

https://www.coursera.org/specializations/intro-cyber-security

https://www.coursera.org/specializations/pythonforcybersecurity

Others resources suggested by instructor

LAB WORK: Students are required to complete minimum 5 practical's on each unit in addition to the assignments published by the teacher on notice board / during practical's etc.

COURSE OBJECTIVE

- The Student should able to learn the Algorithmic models of Learning
- To learn Computational learning theory and Data visualition.

Course Title	Domain Specific Elective - 2# Pattern Recognition	
Course Practical	Practical based on Pattern Recognition	
Course code	MCA/DSE/560	MCA/DSE/563
Number of Credit	**2 Theory**	**2 Practical**

Course Details	Total Contact Hours	Internal Exam Min/Max	External Exam Min/Max
Theory	2hrs/Week	**16/40**	24/60
Practical	4hrs/Week	**8/20**	12/30

Pattern Recognition

Prerequisite: student should have prior knowledge of probabilities and statistics as well as good programming skills.

About Course

Pattern recognition techniques are concerned with the theory and algorithms of putting abstract objects, e.g., measurements made on physical objects, into categories. Typically the categories are assumed to be known in advance, although there are techniques to learn the categories (clustering). Methods of pattern recognition are useful in many applications such as information retrieval, data mining, document image analysis and recognition, computational linguistics, forensics, biometrics and bioinformatics

Course Outline

Unit-1: Basics of Probability, Random Processes and Linear Algebra (recap): Probability: independence of events, conditional and joint probability, Bayes theorem Random Processes: Stationary and non-stationary processes, Expectation, Autocorrelation, Cross-Correlation, spectra. Linear Algebra: Inner product, outer product, inverses, eigen values, eigen vectors, singular values, singular vectors.

Unit-2: Bayes Decision Theory: Minimum-error-rate classification. Classifiers, Discriminant functions, Decision surfaces. Normal density and discriminant functions. Discrete features.

Unit-3: Parameter Estimation Methods: Maximum-Likelihood Estimation: Gaussian case. Maximum a Posteriori estimation. Bayesian estimation: Gaussian case. Unsupervised learning and clustering - Criterion functions for clustering. Algorithms for clustering: K-Means, Hierarchical and other methods. Cluster validation. Gaussian mixture models, Expectation-Maximization method for parameter estimation. Maximum entropy estimation.

Sequential Pattern Recognition. Hidden Markov Models (HMMs). Discrete HMMs. Continuous HMMs. Nonparametric techniques for density estimation. Parzen-window method. K-Nearest Neighbour method.

Text Books:

- K. P. Murphy, Machine Learning: A Probabilistic Perspective, MIT Press, 2012.
- C. M. Bishop, Pattern Recognition and Machine Learning, Springer, 2006.
- R. O. Duda, P. E. Hart, D. G. Stork, Pattern Classification, 2nd edition, John Wiley & Sons, Inc., 2000.
- S. Theodoridis, K. Koutroumbas, Pattern Recognition, 3rd edition, Academic Press, 2006.
- D. Koller, N. Friedman, Probabilistic Graphical Models: Principals and Techniques, MIT Press, 2009.
- Webb, Statistical Pattern Recognition, 2nd edition, John Wiley & Sons, Inc., 2002.
- T. Hastie, R. Tibshirani, J. Friedman, The Elements of Statistical Learning, Springer, 2003.
- K. Fukunaga, Introduction to Statistical Pattern Recognition, Academic Press, 1990.
- R. Schalkoff, Pattern Recognition: Statistical, Structural and Neural Approaches, John Wiley & Sons, Inc., 1992.
- K. Jain, R. C. Dubes, Algorithms for Clustering Data, Prentice Hall, 1988.

Web Link:

- https://www.cse.iitm.ac.in/course_details.php?arg=Mjc=
- https://www.isip.piconepress.com/courses/temple/ece_8527/syllabus/current/

5. OJT/FP (On Job Training / Field Project)

On-the-job training (widely known as **OJT**) is an important aspect for students. On the job training is a form of training provided at the workplace. During the training, students are familiarized with the working environment they will become part of. Students also get a hands-on experience using systems, software's, machinery, equipment, tools, materials, etc. Part of on-the-job training is to face the challenges that occur during the performance of the job. An experienced employee or a manager are executing the role of the mentor who through written, or verbal instructions and demonstrations are passing on his/her knowledge and company-specific skills to the new students. Executing the training on at the job location, rather than the classroom, creates a stress-free environment for the students.

On-the-job training and its effectiveness is based on the use of existing workplace, tools, systems, software's, machines, documents and equipment, and the knowledge of specialists who are working in this field. On-the-job training is easy to arrange and manage and it simplifies the process of adapting to the new workplace. On-the-job training is highly used for practical tasks. It is inexpensive, and it doesn't require special equipment that is normally used for a specific job. Upon satisfaction of completion of the training, the employer is expected to retain participants as regular employees.